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STEP

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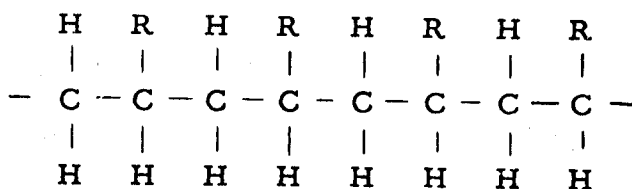
AUTHOR: Shih, Kuan-i (0670/6034/0001)

TITLE: Asymmetrical polymerization of olefins

PERIODICAL: Hua Hsüeh T'ung Pao, no. 10, 1961, 16-18

TEXT: Addition polymerization of olefins such as  $\text{CH}_2 = \text{CHR}$ ,  $\text{CH}_2 = \text{CRR}'$ , and  $\text{CHR} = \text{CHR}'$  will produce polymers containing asymmetrical carbon atoms. The substituting groups may appear in one of the following arrangements:

Isotactic

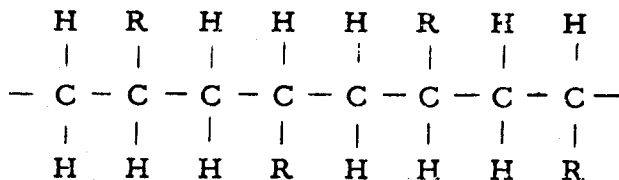


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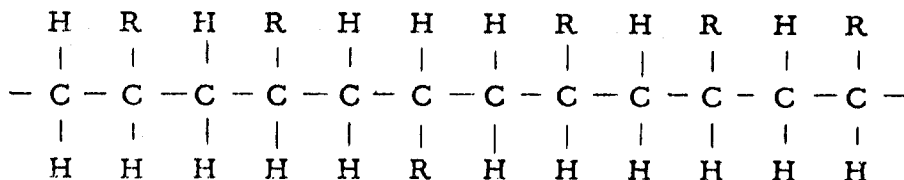
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Syndiotactic



Atactic



Since the chances of occurrence in the varying arrangements are equal, the polymers are

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externally compensated compounds in a -dddd- and also in a -llll- structure (sometimes in a dddd--ddll...lldd...ddll structure) with the absence of optical activity. Natta successfully synthesized polymers with optical activity using 1, 3-butadiene derivatives and cyclic alkyl-ethyl ether such as benzofuran none of which contain asymmetrical carbon atoms. Polymers obtained from 1, 3-butadiene derivatives are in the form of

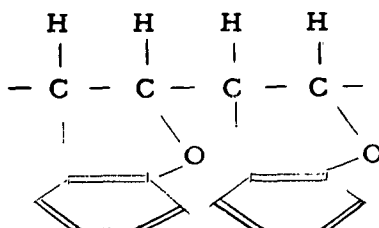
$$- \overset{*}{\text{CH}}(\text{COOR}')\text{CH} = \text{CH}\overset{*}{\text{CH}}(\text{R}) - \overset{*}{\text{CH}}(\text{COOR}')\text{CH} = \text{CH}\overset{*}{\text{CH}}(\text{R}) -$$

Theoretically, four pairs of dl isomers can be obtained, i.e., dl-trans-orythro, dl-trans-threo, dl-cis-threo, and dl-cis-orythro. Investigation by means of infrared spectra and x-rays revealed that a molecular cycle of 4.83 Å is incapable of initiating optical activity in polymers. The stereospecific polymer structure is determined by the cation radicals. Complexing agents such as menthyl ethyl ether containing asymmetrical carbon atoms may cause optical activity such as catalysts having asymmetrical carbon atoms do. Polymers obtained from alkyl ethyl ether do not possess optical activity. If a cyclic monomer is used, the polymer having optical activity will appear in the following structure: ✓✓

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Based on this principle, Natta synthesized polybenzofuran having optical activity with  $\text{AlEtCl}_2$ , amino acid, sulphonic acid, and ammonium quaternaries using alkaloid as a catalyst. The author concludes that the study of asymmetrical polymerization of olefins is helpful to the development of molecular structure, optical activity of molecules, and directional polymerization. There are 3 tables. English-language reference: Chem. Eng. News, 39 (3), 44 (1961). ✓

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